Musings on Filters by the WFIRST SDT Galactic Plane and General Observer Task Group

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First Priority: K-band Filter

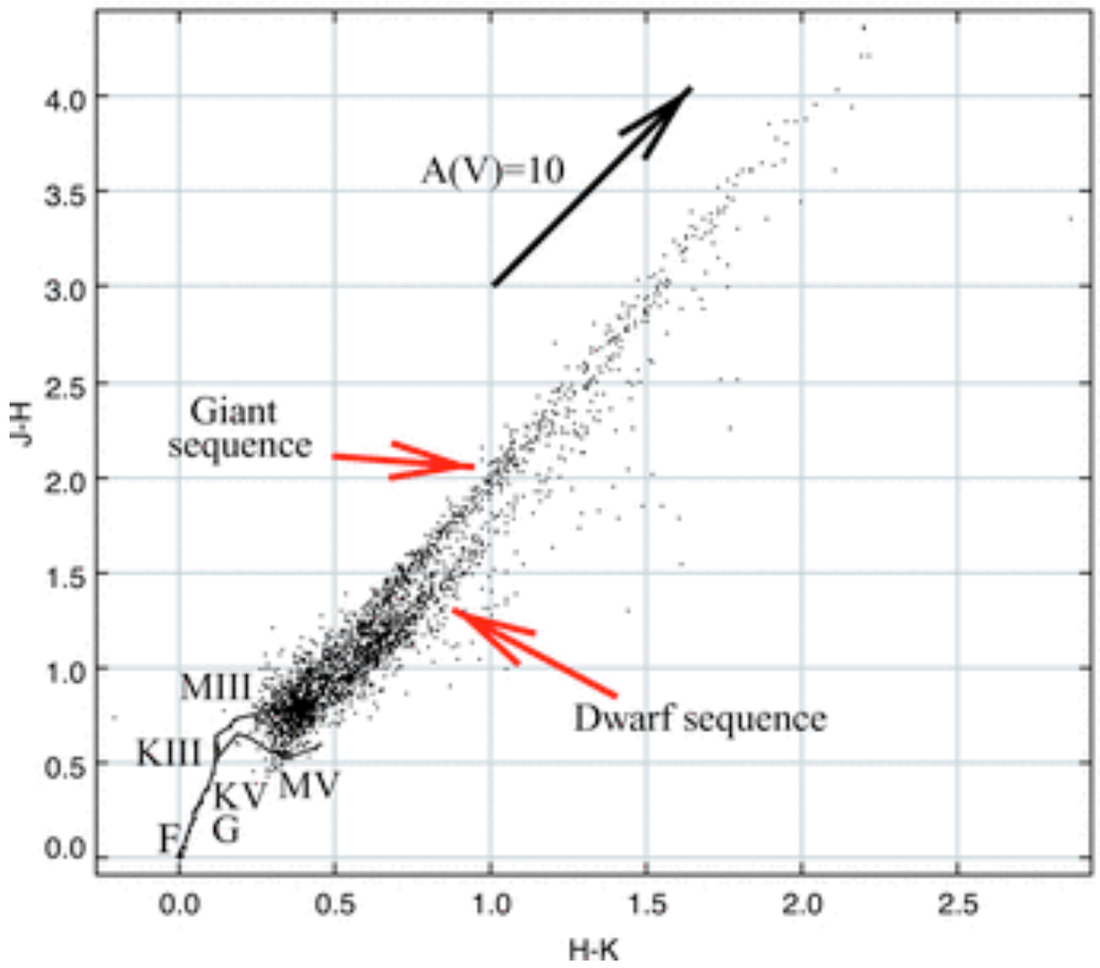
• **Galactic Plane Survey:** K-band is deemed essential. Reddening and lower effective temperature (T_{eff}) produce similar trends in most other color-color diagrams. However, including K-band allows one to break the reddening - T_{eff} degeneracy.

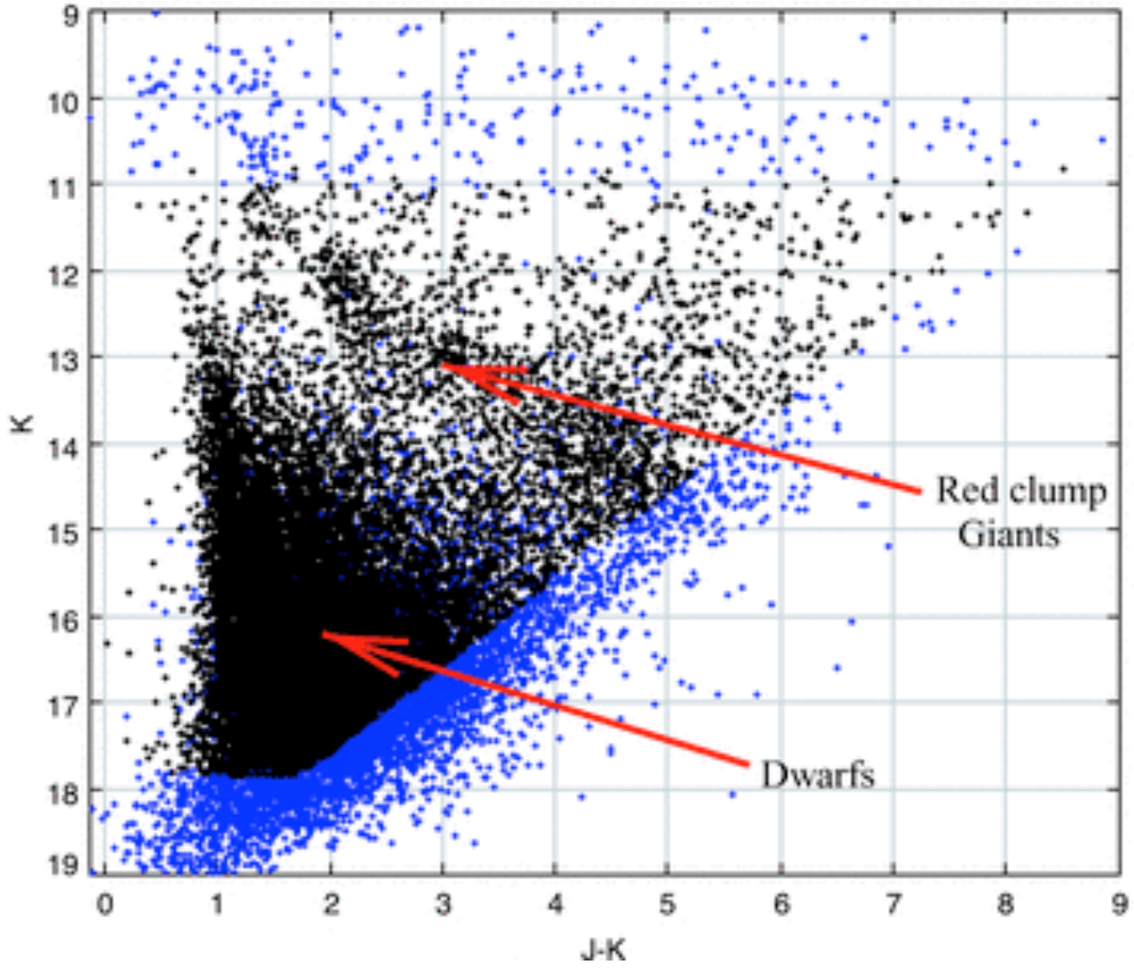
• **A(K) < A(H):** K-band is less susceptible to extinction.

• **Young Stellar Objects (YSOs):** K-band probes warm dust emission in inner edge of circumstellar disk for actively accreting young stars. Therefore, T-Tauri-type stars are easily identified from their redder H-K colors relative to (heavily reddened) main sequence stars.

• **Extragalactic GO Programs:** For an old stellar population, k-corrections are more beneficial at K-band than for bluer passbands.

UKIDSS Galactic Plane Survey

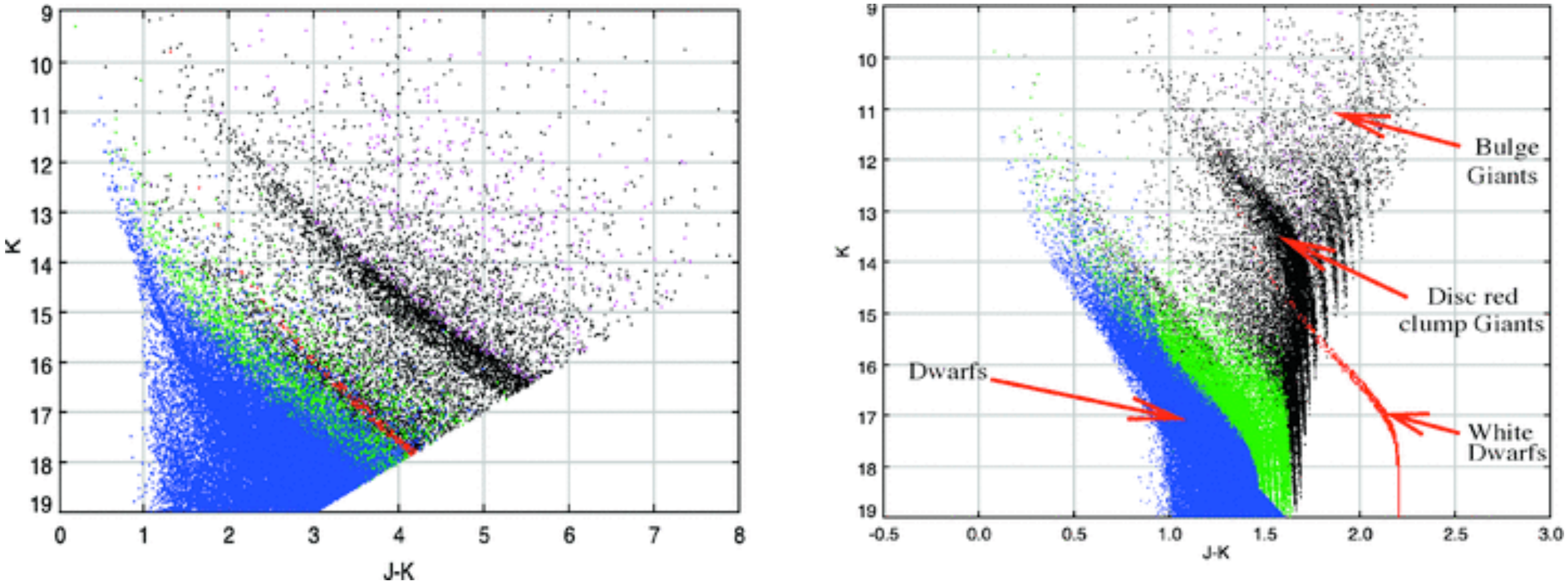




• (l, b) = (31, 0) from UKIDSS Galactic Plane Survey. Unreddened stars from Hewett et al. (2006) shown by lines in left panel. K-band allows for robust separation of dwarfs and giants. The winding red clump track in right panel indicates variable reddening.

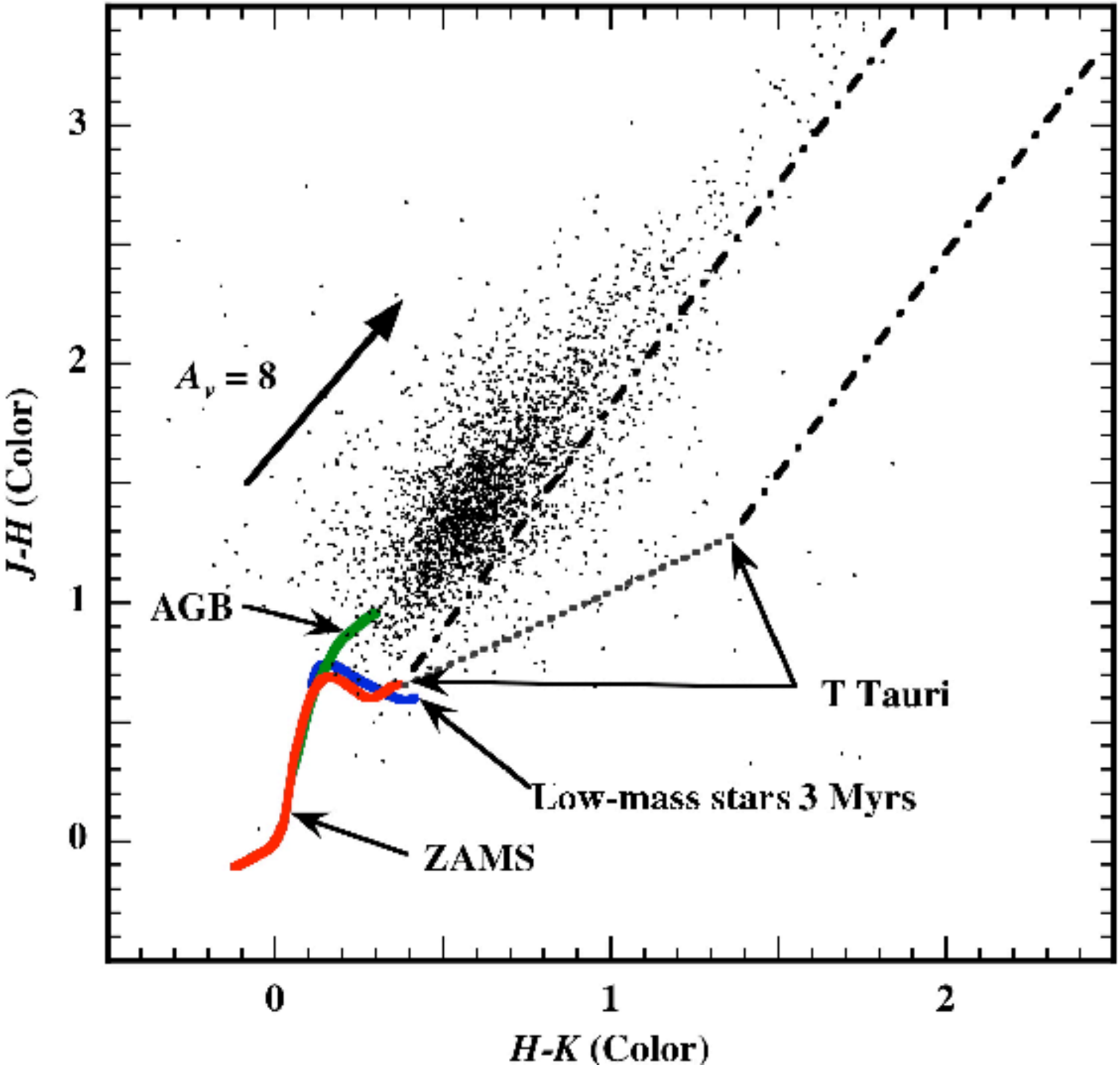
Lucas et al. (2008, MNRAS 391, 136)

UKIDSS Galactic Plane Survey

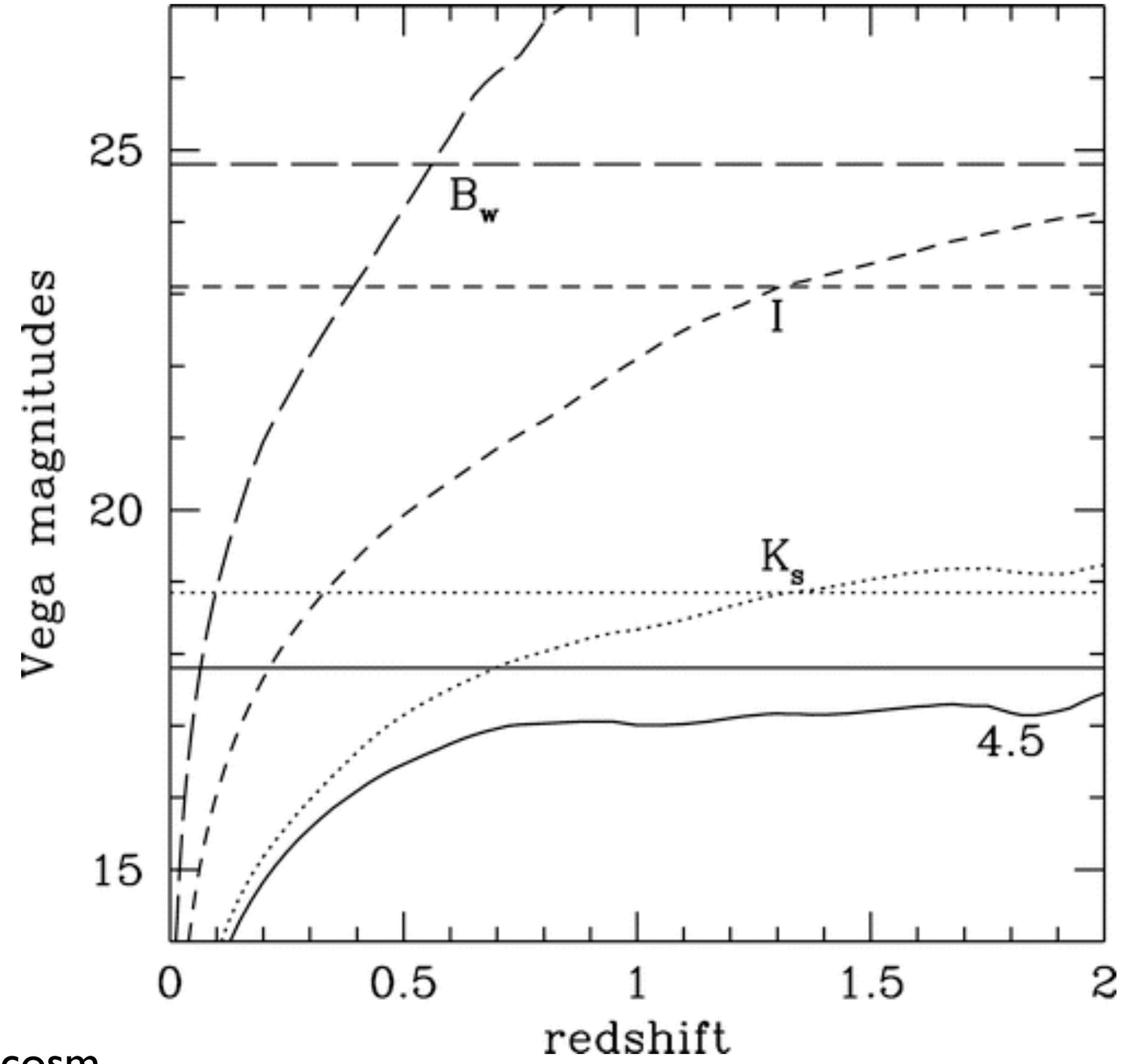


• Besancon model color-magnitude diagram in two regions of the Galactic plane: left corresponds to (l, b) = (31, 0); right corresponds to (l, b) = (15, 1). K-band data allows for robust separation of dwarfs (blue) from subgiants (class IV; green) and giants (class V; black).

Lucas et al. (2008, MNRAS 391, 136)



Klotz et al. (2004, A&A, 425, 927)



- BC03 model
  - 0.1 Gyr burst
  - z(f) = 3
  - concordance cosm.

Eisenhardt et al. (2008, ApJ, 684, 905)

Lower Priority: Other Filters

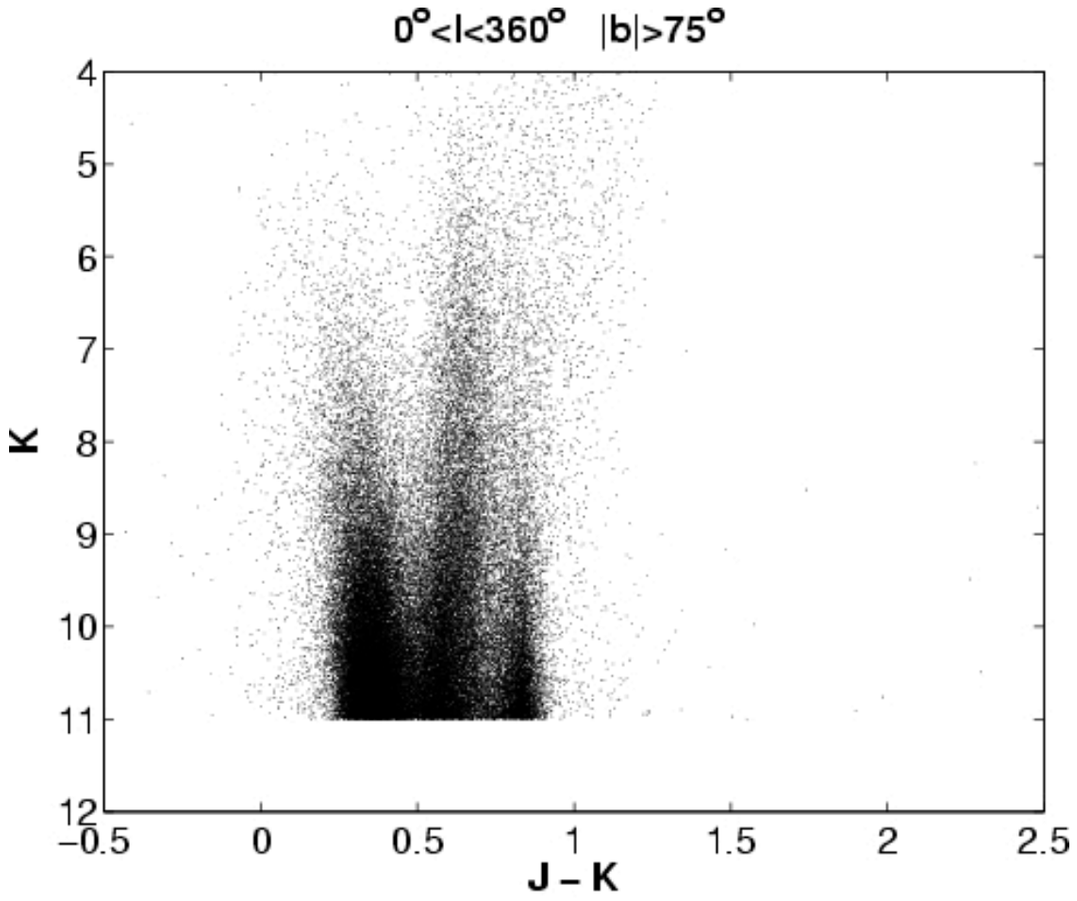
• Our task group has touched on other filter ideas, but none deemed as essential (or as likely) as a K-band filter. E.g.,

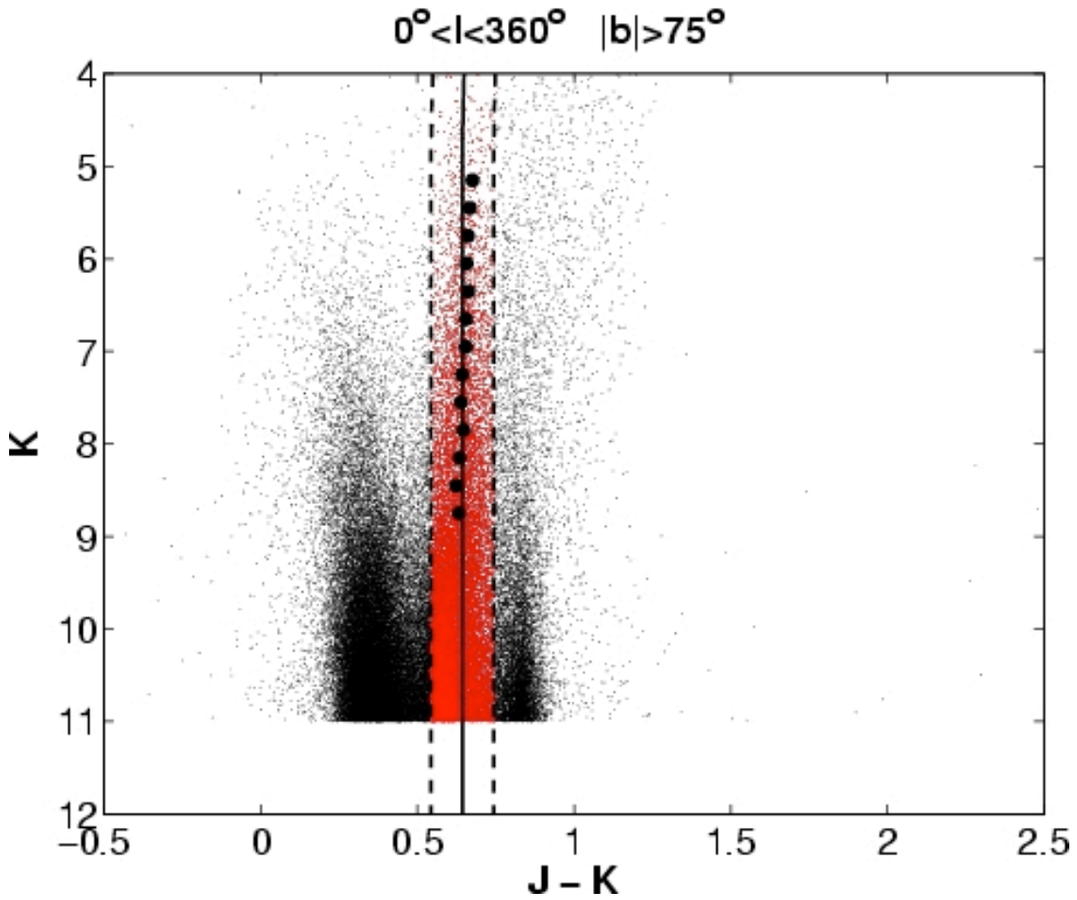
• **Narrow-band filter(s):** First choice would probably be the 2.12 μm (1-0) H_2 filter, which is useful for studying Galactic jets, Herbig-Haro objects, outflows. This filter, which is used by the UKIDSS Galactic Plane Survey, would also double as an Hα filter at z=2.23 (and a Lyα filter at z=16.4).

• **Optical filter(s):** Not likely to be important for Galactic Plane Survey, but might be useful for GO programs - e.g., for areas of sky not covered by LSST.

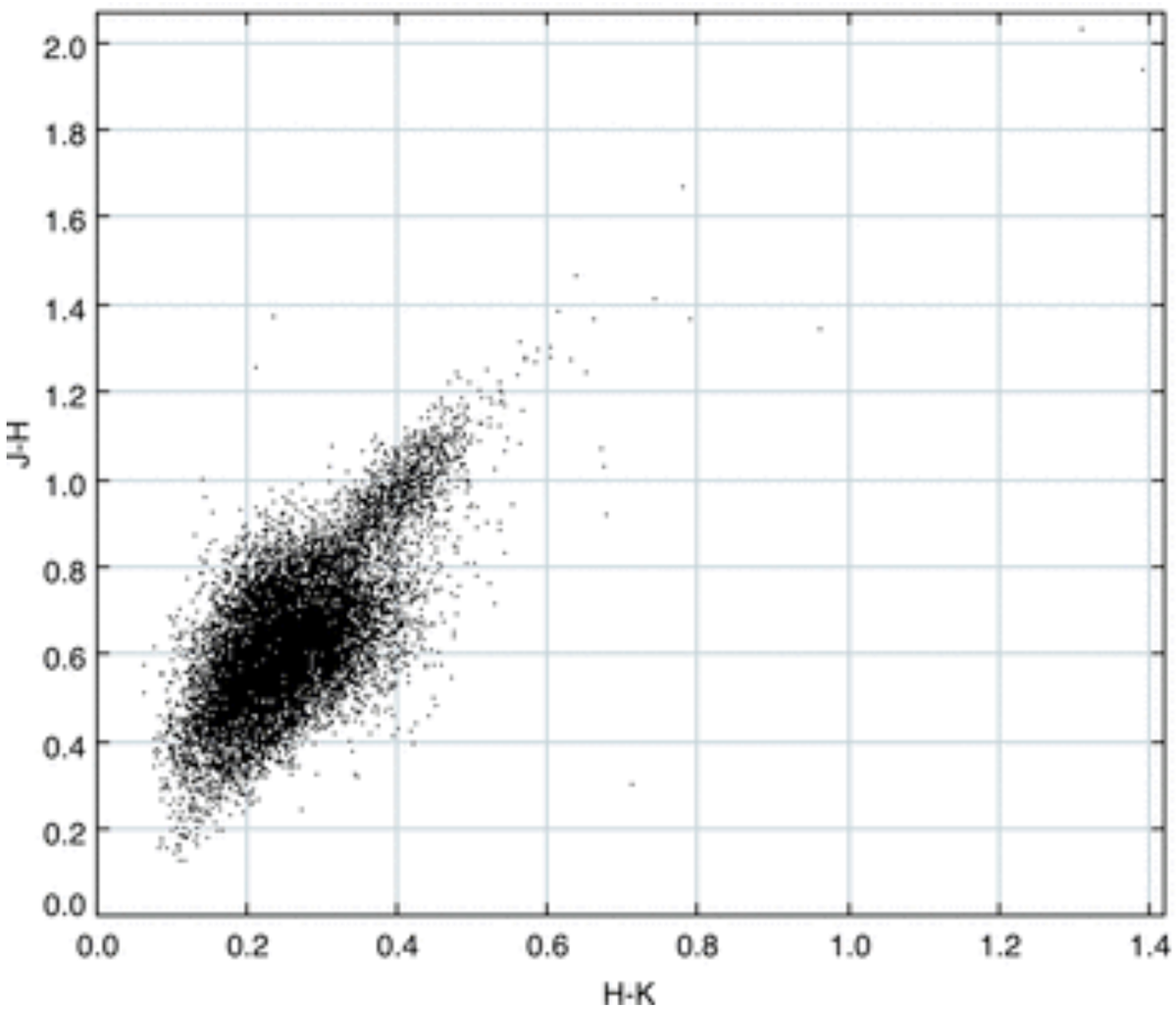
• **Longer wavelength filter(s):** Would be even more useful than K-band, but doesn't seem likely.

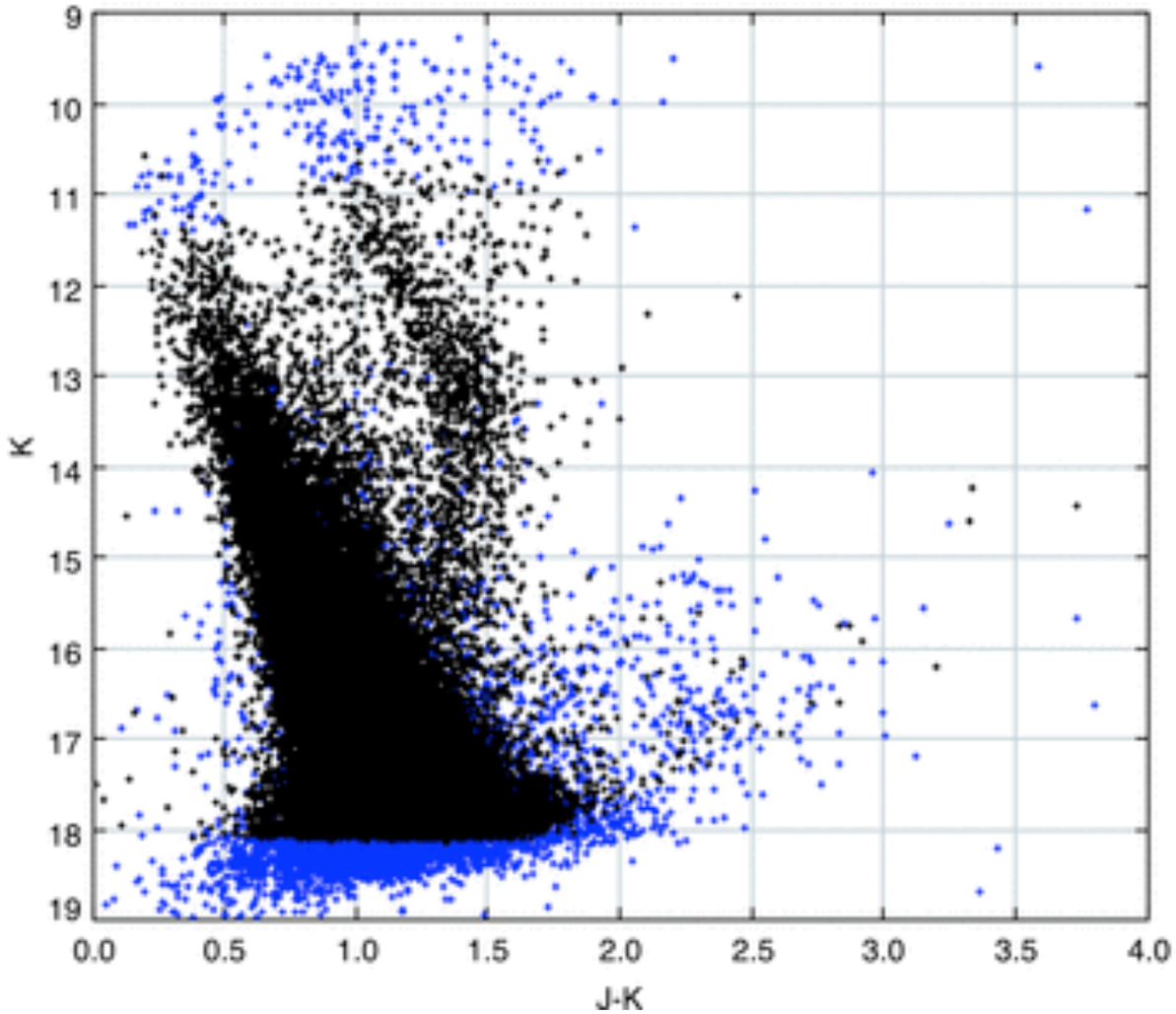
Back-Up Slides



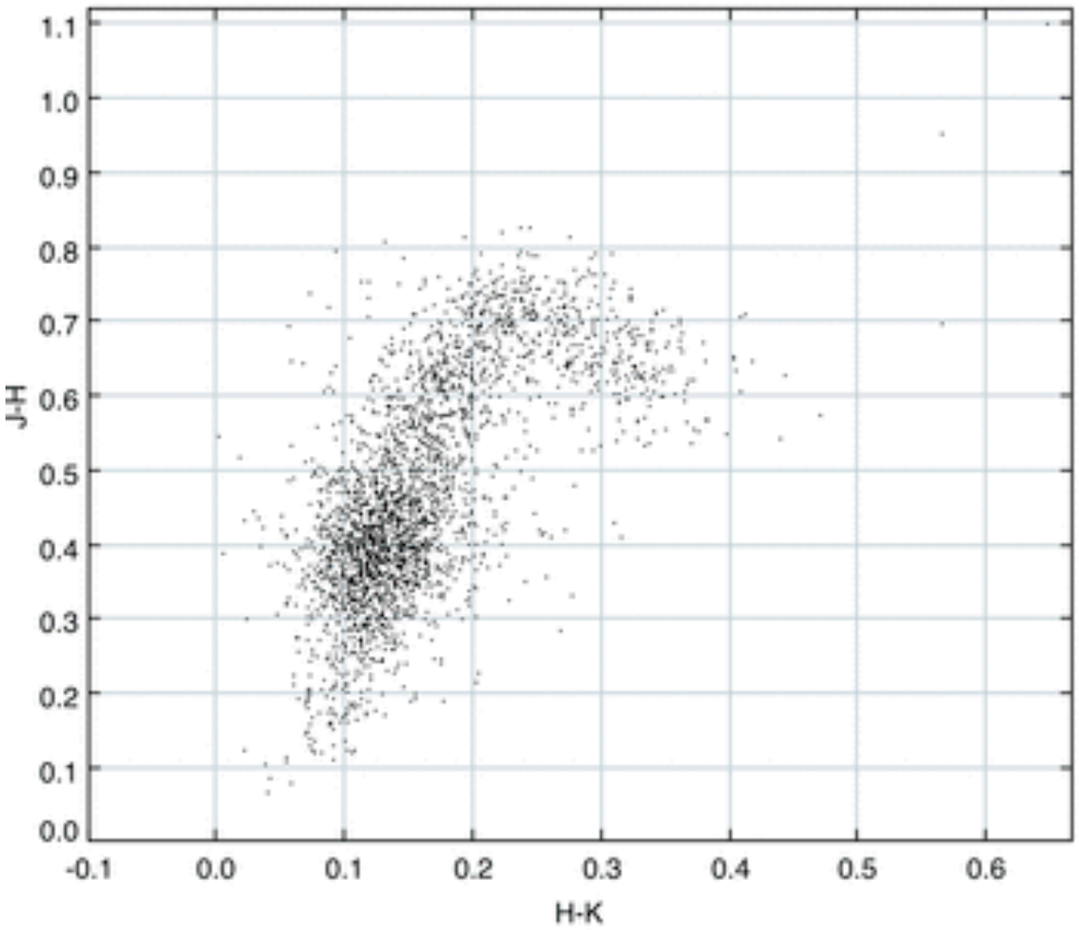


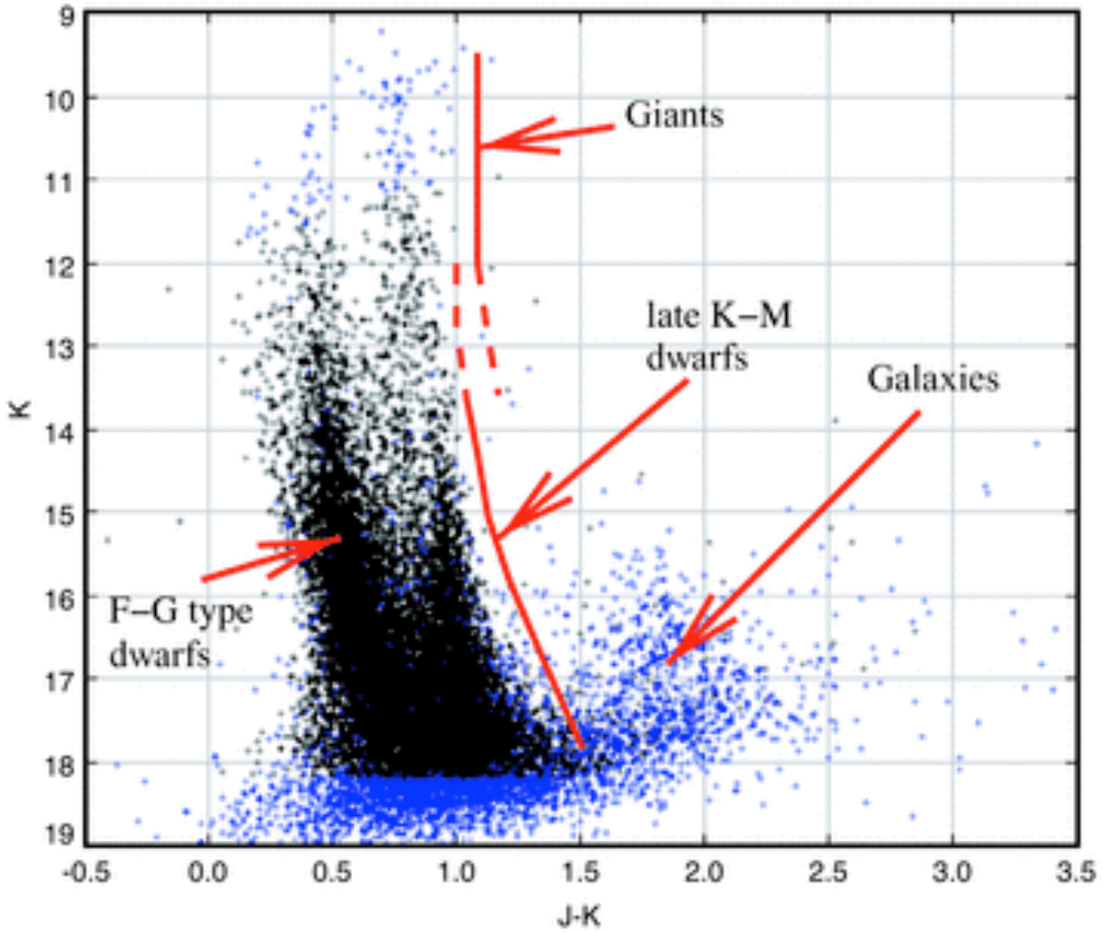
Cabrera-Lavers et al. (2005, A&A, 433, 173)

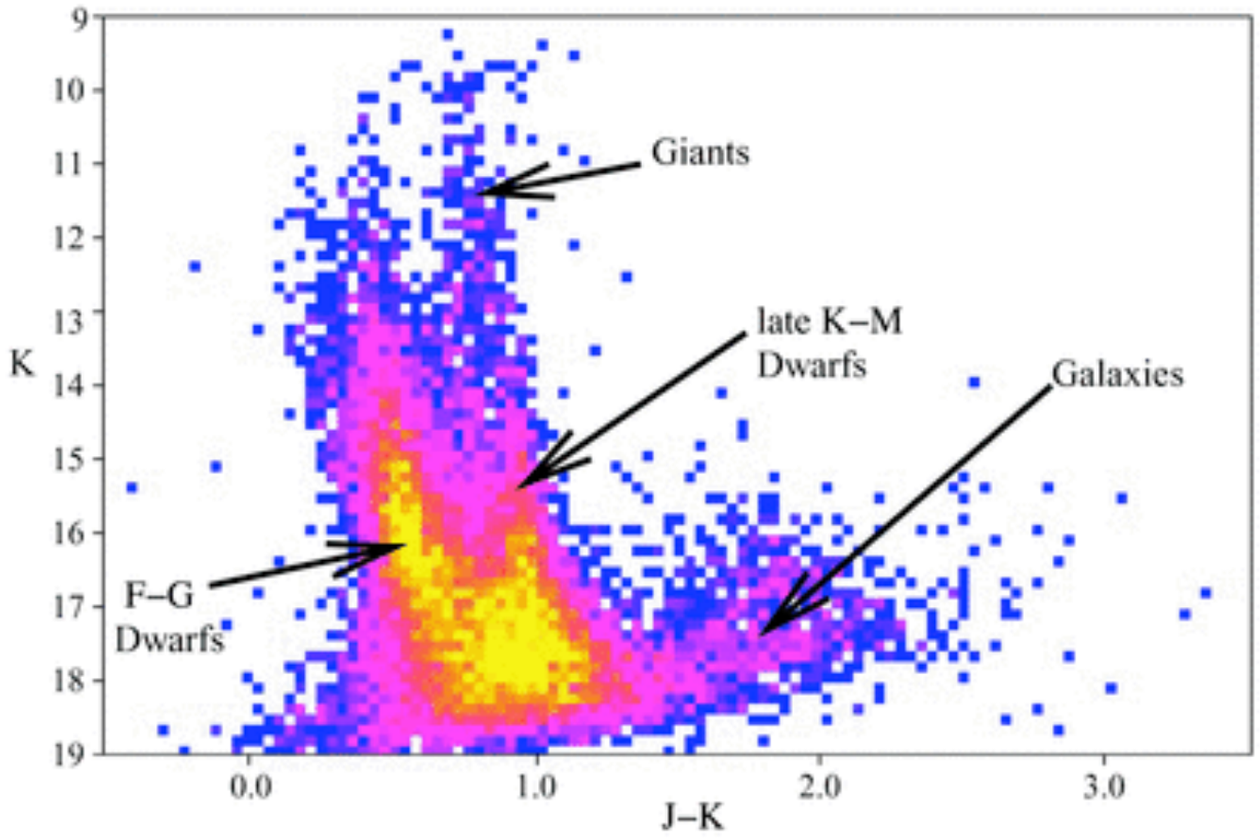




Lucas et al. (2008, MNRAS 391, 136)







Lucas et al. (2008, MNRAS 391, 136)